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10/821,957	04/12/2004	Takayuki Suzuki	Q80989	2365

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EXAMINER	
LANGMAN, JONATHAN C	

ART UNIT	PAPER NUMBER
1794	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/821,957	SUZUKI, TAKAYUKI	
	Examiner	Art Unit	
	JONATHAN C. LANGMAN	1794	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 April 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8* is/are pending in the application.

4a) Of the above claim(s) *3-7* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2 and 8* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *4/24/2008*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 2, and 8 are rejected under 35 U.S.C. 102(a) and 102 (e) as being anticipated by Melnik et al., (US 6,936,357).

Regarding claim 1, Melnik et al. teach a self supported nitride semiconductor with a diameter of 10mm or more and thickness greater than 200 microns (col. 3, lines 15-18). Melnik go on to teach that the bulk nitride semiconductor preferably has a FWHM (full width half maximum) of the x-ray rocking curve ranging from 60-360 arc seconds, thus encompassing a FWHM of less than 500 seconds or less, as instantly claimed. Although Melnik is silent to the specific diffraction plane that this FWHM occurs in, it is inherent that the instantly claimed diffraction plane of {20-24} is taught by Melnik. Since Melnik teaches that the FWHM of the semiconductor is less than 360, it can be assumed, expected and inherent that the plane of {20-24} within Melnik's semiconductor is less than 360 arc seconds. The burden is upon the applicant to show that the instantly claimed FWHM for the instantly claimed diffraction plane is not present within the structure of Melnik, and the applicant is invited to show evidentiary support showing otherwise. The material and process of making the material of Melnik is substantially

the same to the applicants claimed material and processes therefore, it is inherent, although Melnik is silent to, that the FWHM of 500 arc sec or less for {20-24} is present.

It has been held that where the claimed and prior art products are identical or substantially identical in structure or are produced by identical or a substantially identical processes, a prima facie case of either anticipation or obviousness will be considered to have been established over functional limitations that stem from the claimed structure. *In re Best*, 195 USPQ 430, 433 (CCPA 1977), *In re Spada,* 15 USPQ2d 1655, 1658 (Fed. Cir. 1990). The ***prima facie*** case can be rebutted by evidence showing that the prior art products do not necessarily posses the characteristics of the claimed products. *In re Best*, 195 USPQ 430, 433 (CCPA 1977).

Regarding claim 2, Melnik teaches that the semiconductor may be doped during growth to achieve n or p-type conductivity the carrier concentration is less than 10^{20} atoms/cm^3 (col. 10, lines 1-10).

Regarding claim 8, Melnik et al. teach growing a diode structure upon the substrates with epitaxial deposition of a nitride layer thereon (see at least col. 12, lines 63-67).

Claims 1, 2, and 8 are rejected under 35 U.S.C. 102(a) and 102 (e) as being anticipated by Melnik et al. (US 6,936,357) as evidenced by Albrecht et al, "Dislocation reduction in AlN and GaN Bulk Crystals Grown by HVPE".

Regarding claim 1, Melnik, as discussed above, teaches a bulk nitride semiconductor grown by HVPE with large dimensions that has a FWHM for a diffraction

plane 360 seconds or less. Melnik is silent to the specific diffraction plane that is present for the FWHM. Previous work of Melnik et al. (Albrecht et al.), characterized a HVPE grown nitride semiconductor. Albrecht characterized the semiconductor for its FWHM at {11-24} and found it to be around 110 seconds (table 1). Albrecht was silent to the {20-24} plane, however, in light of the present specification as discussed below in the 103 rejection, it is inherent that the planes of {11-24} and {20-24} for HVPE grown nitride semiconductors, have similar FWHM's. Therefore, it is inherent that the GaN structure of Albrecht et al. has a FWHM for {20-24} of about 110 seconds, and thus it is inherent that since Melnik and Albrecht teach the same semiconductor materials and the same growth processes, that this FWHM present in Albrecht is also present in Melnik et al. The applicant is directed towards the case law In re Best presented above.

Regarding claim 2, Melnik teaches that the semiconductor may be doped during growth to achieve n or p-type conductivity the carrier concentration is less than 10^{20} atoms/cm^3 (col. 10, lines 1-10).

Regarding claim 8, Melnik et al. teach growing a diode structure upon the substrates with epitaxial deposition of a nitride layer thereon (see at least col. 12, lines 63-67).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 2, and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over "Dislocation reduction in AlN and GaN Bulk Crystals Grown by HVPE" to Albrecht et al. in view of Melnik et al. (US 6,936,357).

Regarding claim 1, Albrecht et al. teach GaN and AlN crystals grown by hybrid vapor phase epitaxy (HVPE). The GaN crystals have a FWHM, (full width at half maximum) of rocking curves from a GaN bulk crystal at a diffraction plane of {11-24} plane, of less than 500 seconds, specifically 110-180 arc seconds (Albrecht et al., Table 1). Albrecht is silent to the FWHM of the {20-24} plane. Albrecht teaches a low FWHM for the {11-24} plane of a nitride semiconductor grown by HVPE, and within the instant specification the applicant's teach a low FWHM of {11-24}, and {20-24} for a nitride semiconductor grown by HVPE. When reviewing the examples provided by the applicant within the specification, the Examiner correlates that the two planes of {11-24} and {20-24} are very similar in values for FWHM for HVPE grown nitride semiconductors. Values for the {20-24} and {11-24} planes are shown by the applicants to be 278 and 286, respectively, on page 12; 550 and 568 respectively in comparative example 1; 820 and 845 for comparative example 2; and 322 and 336 respectively in Example 2. Due to the applicants specification teaching the close correlation of FWHM's between the two diffraction planes, and that the prior art and the instant specification teach similar materials and similar processes for achieving them, it is assumed, expected and intrinsic that the less than 500 FWHM of {11-24} plane of

Albrecht will also have a less than 500 FWHM of {20-24} plane. The applicant is directed to the case law In re Best presented above.

Albrecht teach in section 2.1 that GaN crystals are grown to a maximum size of about 7 mms diameter and 100 microns thickness. Albrecht thus fails to teach the specified dimensions of the instant claim. However, Melnik et al. who share common inventors with Albrecht et al., have shown the production of large scale nitride semiconductors overlapping the instantly claimed dimensions. It is a natural progression in the technology of semiconductor based electronics to make the substrates as large as possible in order to improve production and costs, by providing larger substrates to build devices upon. It is well known in the art and also taught by Melnik et al. that nitride semiconductor substrates can be grown by HVPE with large diameter dimensions. Melnik et al. teach that the nitride substrate crystals will have a minimum dimension of 1 cm in the x, y, and z directions. Thus showing a crystal with a diameter of 10 mm (1 cm) or more (Melnik et al. col. 3, lines 10-17). It would have been obvious to a person having ordinary skill in the art at the time the present invention was made to grow the nitride semiconductor as taught by Albrecht et al. comprising a FWHM of less than 500 microns at {11-24} and inherently {20-24}, to a diameter of 10 mm or more, because Melnik et al. have shown that nitride semiconductor crystals of these diameters are grown in the art with HVPE, (the same method of Albrecht et al..), and it has been shown that a desire to grow larger crystals is present.

Furthermore, it would have been obvious to a person having ordinary skill in the art at the time of the invention to adjust the diameter for the intended application

because, where the only difference between the prior art and the claims is a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device is not patentably distinct from the prior art device. *In Re Gardner v. TEC Systems, Inc., 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984) cert. denied, 469 U.S. 830, 225 USPQ 232 (1984)* .

Regarding claim 2, the crystal as taught by Albrecht et al. is never mentioned to be doped therefore it is assumed that it is undoped. Albrecht et al. teach that the dislocation (carrier) density is said to be as low as 3×10^6 cm^{-2} (Albrecht et al. pg 455). And in another example teach that the dislocation density ranges from 10^9 to 10^5 cm^{-2} (Albrecht et al., pg. 456), which falls within the instantly claimed ranges. Also Melnik et al. teach that the dislocation density is preferably less than 10^4 cm^{-2} (Melnik et al., col. 5, lines 5-10).

Furthermore, Melnik et al. teach that the bulk nitride semiconductor material may be doped during growth to achieve n-, I-, or p- type conductivity as desired (Melnik et al., abstract). It would have been obvious to a person having ordinary skill in the art at the time the present invention was made to dope the structure of Albrecht et al. to any desirable conductivity. Dependent upon the specific application any dopant amount may be used to achieve desired conductivities. It would have been obvious to one having ordinary skill in the art at the time of the invention to adjust the dopant levels, including that presently claimed, for the intended application to achieve desired conductivities, since it has been held that discovering an optimum value of a result

effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Regarding claim 8, Albrecht et al. teach a freestanding nitride semiconductor wafer as described above, however, they are silent to the formation of a light-emitting device on the substrate. The substrate as taught by Albrecht et al. is more than capable of being used as a substrate for the formation of an LED. Furthermore, Melnik et al. teach that the GaN substrates are used in the applications of light emitting diodes where devices are formed on the GaN substrates of the invention (Melnik et al, col. 1, lines 15-40). It would have been obvious to use the substrate of Albrecht et al. to build an LED device on top, as Melnik has shown the two nitride semiconductor substrates to be functional equivalents.

Response to Arguments

Applicant's arguments filed April 24, 2008 have been fully considered but they are not persuasive.

The applicants submit that it is quite clear that Albrecht cannot and will not produce any free standing bulk GaN material having a diameter of 10 mm or more as disclosed and claimed in the present application. However, Albrecht is never used for size so these arguments are not commensurate with the rejections set forth. In the 102 rejection of Melnik as evidenced by Albrecht, Albrecht is only relied upon for the teaching of the diffraction plane and respective FWHM. In the 103(a) rejection set forth

in the last office action, of Albrecht in view of Melnik, again Albrecht is only used for the diffraction plane and FWHM, and Melnik is used to teach the size.

******As a side note: The Examiner agrees that Albrecht's HVPE results in a smaller diameter, however it is and was, the Examiner's position, that this was the case in 1999. Members of the same inventive entity are seen in Melnik (i.e. Dmitriev and Melnik). On January 21, 2003, the filing date of Melnik, Melnik has been able to successfully form crack free nitride semiconductors by HVPE, with diameters greater than 10 mm. This is a natural progression in the art to create larger nitride semiconductors, in order to provide more surface area for the subsequent building of devices thereon. In conclusion, it is not difficult, as evidenced by Melnik (not Albrecht) to obtain large size crystals of GaN by HVPE.

The applicant has not provided evidence or persuasively shown that the FWHM for the {20-24} plane is not present in either Albrecht or Melnik. Melnik teaches in col. 8, lines 10-16, that the processed material has a FWHM from 60-360 arc-secs. There is no diffraction plane specifically taught for this plane, so it is the Examiners position that this FWHM includes the {20-24} plane. The applicant points to a specific example in Melnik col. 11, lines 32-35, where Melnik teaches a (0002) plane. However, this is merely a specific example. The Applicants are attempting to argue a specific example in order to destroy the reference as a whole. However, the applicants have not properly argued the Examiners position as set forth above and in the last office action where

Melnik teaches a FWHM, over a broad spectrum of diffraction planes (col. 8, lines 12-16).

The applicants set forth a table, showing FWHM's for the [20-24} and {0002} planes in 4 examples. However this recitation, is not commensurate with Melnik. Melnik teaches a FWHM of close to 300 for {0002}, or a range of 60-360 arc secs, which is more represented by the examples 1 and 2, which teach FWHM's of 275 and 254, respectively. The applicant argues that a FWHM of less than 250 does not necessarily result in FWHM of less than 500 for a {20-24} plane. However this argument is not commensurate with the scope with the prior art. The prior art teaches at the very least a range of 60-360 arc seconds or a specific example of 300 for the {0002} planes. The values of Example 1 and Example 2 in the Table provided by the applicant satisfy the ranges taught by Melnik, and therefore it is expected and inherent that the FWHM of {20-24} will fall below 500, for at least some of the FWHM for {0002} ranges as taught by Melnik.

Furthermore, by showing this generic table, the applicants have not persuasively shown or provided evidence showing that **the crystal of Melnik** does not have a FWHM of less than 500 for a diffraction plane of {20-24}. "The burden is upon the applicant to show that the instantly claimed FWHM for the instantly claimed diffraction plane is not present within the structure of Melnik, and the applicant is invited to show evidentiary support showing otherwise".

The applicants have not argued against the Examiners position set forth on page 7, of the Non final office action dated January 24, 2008, where the examiner states "It would have been obvious to a person having ordinary skill in the art at the time the present invention was made to grow the nitride semiconductor as taught by Albrecht et al. comprising a FWHM of less than 500 microns at {11-24} and inherently {20-24}, to a diameter of 10 cm or more, because Melnik et al. have shown that nitride semiconductor crystals of these diameters are grown in the art with HVPE, (the same method of Albrecht et al.), and it has been shown that a desire to grow larger crystals is present".

The applicants have not argued against the Examiners position set forth on page 7, of the Non final office action dated January 24, 2008, where the examiner states "it would have been obvious to a person having ordinary skill in the art at the time of the invention to adjust the diameter for the intended application because, where the only difference between the prior art and the claims is a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device is not patentably distinct from the prior art device. *In Re Gardner v. TEC Systems, Inc., 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984) cert. denied, 469 U.S. 830, 225 USPQ 232 (1984).*"

Summary:

It is thus the Examiners position that:

- The FWHM of between 60 and 360 of Melnik, inherently encompasses the {20-24} plane.
- The instantly claimed FWHM for the instantly claimed diffraction plane is inherently present in Melnik since Melnik teaches the same material and same process. See in re Best.
- It would have been obvious to produce the 1999 crystal of Albrecht larger i.e. up to 10 mm diameter as Melnik has shown that in 2003, the successful large scale production of nitride semiconductors is performed. Larger crystals allow for the increase the size and reduce production costs of semiconductor device building.
- Finally, in view of Gardner, it would have been obvious to adjust the size of the crystal diameters of Albrecht in order to obtain a larger size, since the only difference between the prior art and the instant claims is size.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JONATHAN C. LANGMAN whose telephone number is (571)272-4811. The examiner can normally be reached on Mon-Thurs 6:30 am - 4:00 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Callie Shosho can be reached on 571-272-1123. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JCL
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